Update on the Energy Loss in GLEAM and Dedx code - Muons and Protons

Ping Wang, David Paneque, Elliott Bloom

Overview

- Compare the GLEAM simulation of muons and protons with the calculation using the dedx code
- A first look at the merit variable CalZDir

Muons

- ## Dedx code
  - $<dE/dx>$ = 6.255 MeV/cm for 1.021 GeV muons
- ## GEANT4 8.0.p01
  - $<dE/dx\_FC>$ = 6.349 MeV/cm
- ## GLEAM
  - GlastRelease-v11r17
  - Muons
    - Launch point x = y = 201.17 mm, z = -48.12 mm (the top crystal)
    - Vertical incidence
    - Energy = 1.021 GeV
  - $<dE/dx\_FC>$ = **6.373** MeV/cm if without any cut
    - Gleam (no cuts) Vs. Dedx
      - (6.373-6.255) / 6.255 = **1.9%**
  - $<dE/dx\_FC>$ = **6.542** MeV/cm if cut on CalZDir>0.98
    - No cuts Vs. CalZDir>0.98
      - (6.542-6.373) / 6.373 = **2.6%**

Johan Bregeon's Results for Muons

	G4:1mm	G4: 10mu	Gleam
<Esum(MeV)>	98.99	99.09	99.37
<dEsum(MeV/cm)>	6.218	6.224	6.241
%Diff<dEsum>	-0.5%	-0.5%	-0.2%
<EL0(MeV)>	12.29	12.36	12.35
<dEL0(MeV/cm)>	6.176	6.211	6.206
%Diff<dEL0>	-1.3%	-0.7%	-0.8%

Protons

- ## Dedx code
  - \<dE/dx\> = 5.979 MeV/cm   for 6 GeV protons
- ## GLEAM
  - GlastRelease-v11r17
  - Protons
    - Launch point x = y = 201.17 mm, z = -48.12 mm (the top crystal)
    - Vertical incidence
    - Energy = 6 GeV
  - \<dE/dx_FC\> = **6.102** MeV/cm if without any cut
    - Gleam (no cuts) Vs. Dedx
      - (6.102-5.979) / 5.979 = **2.1%**
  - \<dE/dx_FC\> = **6.242** MeV/cm if cut on CalZDir>0.98
    - No cuts Vs. CalZDir>0.98
      - (6.242-6.102) / 6.102 = **2.3%**

Correlation between dE/dx and CalZDir
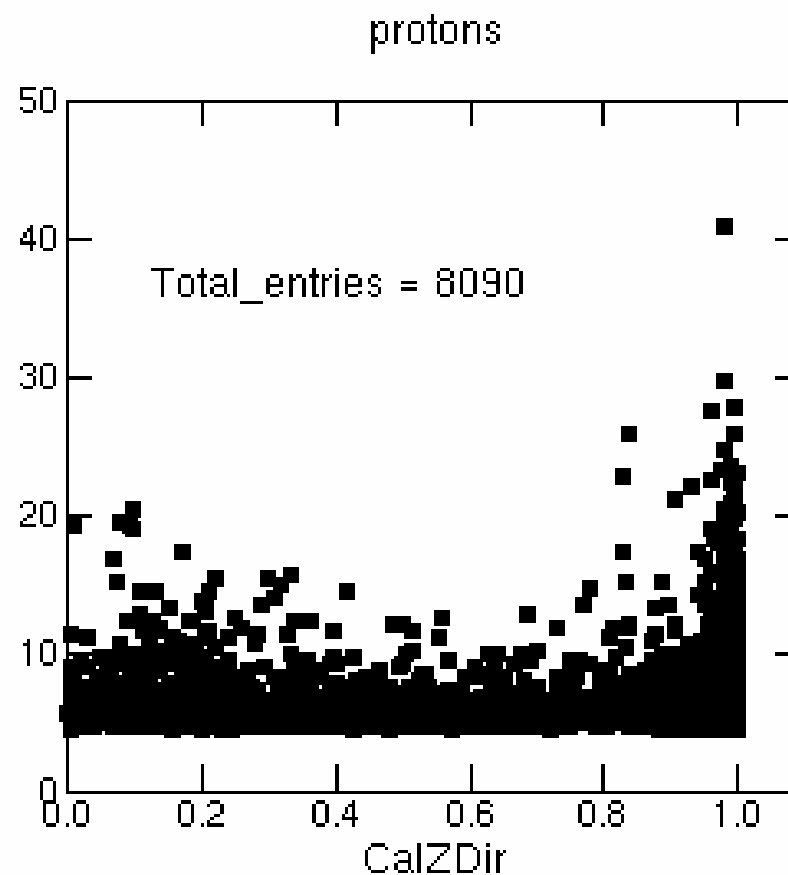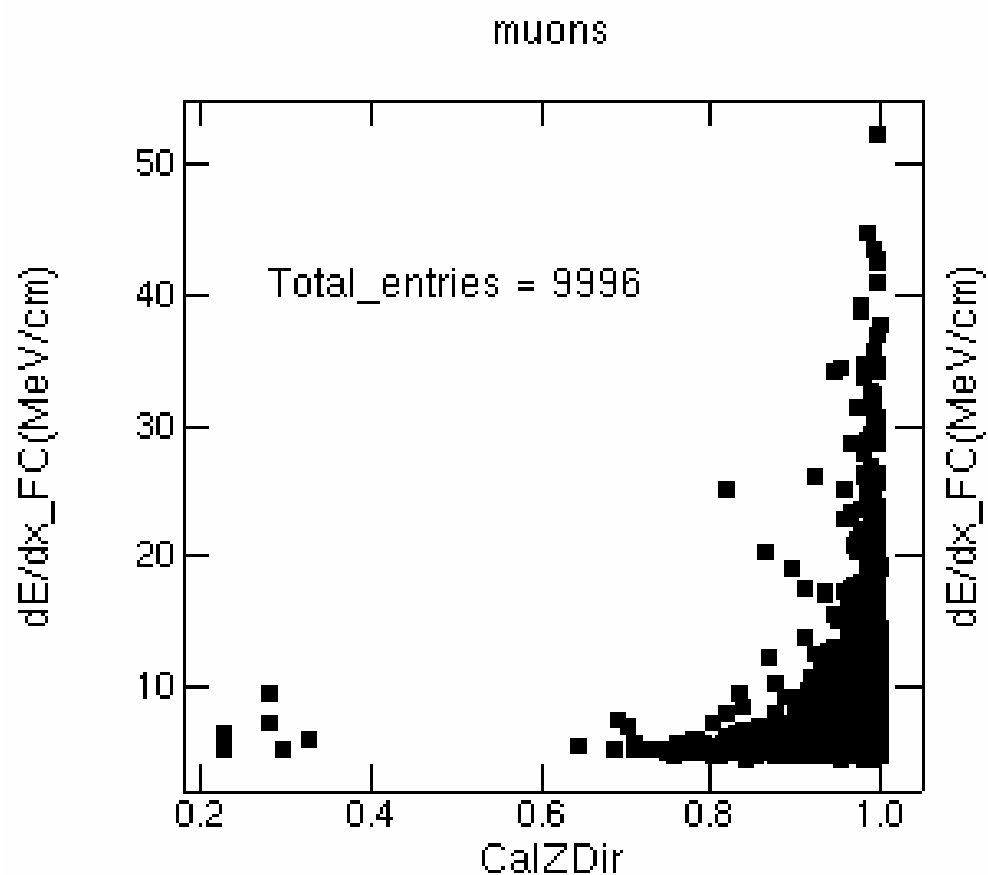
Summary

- The GLEAM simulation of muons and protons is consistent with the dedx code calculation

- The energy loss rate (dE/dx) is correlated with CalZDir